Leverage On-Board Intelligence to Add More Value to Hospitals

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Hospitals are under increasing pressure to become more cost-effective and get more “patient throughput” with the equipment and resources that they have. One way of achieving this is the advancement of on-board device intelligence, as discussed in the following article.

Medical device companies have helped hospitals protect their significant capital investments in “big iron” equipment, such as MRI or CAT scan machines, by designing them to be smart enough to perform analysis, facilitate optimal performance, understand or maintain their configuration, and communicate status to field service representatives. This helps a hospital or clinic run more efficiently, reliably, and effectively.

However, there is a growing opportunity for medical device manufacturers to extend that on-board intelligence beyond optimizing service and maintenance, to add increasingly sought-after value to hospitals in the future.

Advances in technology have enabled medical device companies to push more capability to on-board device intelligence. First, the capability to add intelligence in the form of on-board computers, memory, displays, networking and sophisticated programming has become less expensive. We now see more biomedical equipment, such as heart monitoring equipment, infusion pumps and EKG machines, with intelligence and networking capability built in. In many cases, the user interface, data acquisition, analysis, and presentation capabilities for these devices are driven by on-board computing.

Second, there’s been significant technical progress with respect to secure network access to systems and equipment. These advances have enabled hospitals and clinics to mitigate the risk of exposing patient information and the risk of external viruses. With these risks addressed, hospitals are encouraged to network medical devices to facilitate device maintenance provided by field service organizations, and to enable devices to be integrated with internal asset management systems. The prevalence of on-board intelligence and secure networking will enable hospitals to more effectively manage their device assets, improve their therapeutic use, and

improve patient flow.

On-Board Intelligence for Integrated Asset Management and Networked Devices

Asset management is critical to hospitals because they must manage thousands of pieces of equipment, everything from wheelchairs to EKG machines to infusion pumps. The effective operation of the hospital depends on knowing where each asset is located, what it's scheduled to be doing, and whether or not it's being maintained or available to be used.

If the equipment itself can't help with reporting its location and status, this arduous process must be performed by hospital personnel. With intelligent and integrated tracking, devices can communicate with the hospital's asset management systems, and hospital staff can focus on patient care, instead of equipment whereabouts.

This knowledge enables hospital staff to better manage the flow of patients through their facility and operate more cost effectively. The ability for devices to integrate with a hospital's asset management system is no longer a "nice-to-have" feature; it's a "must-have" capability for medical devices.

In addition, the ability to integrate and network multiple intelligent devices is something hospitals are beginning to explore.

For example, in the past, when a stress test was performed, it would take a fairly comprehensive team of individuals to make adjustments to the treadmill, take the patient's blood pressure, and run the EKG. Now, all the equipment—the EKG, the treadmill, the blood pressure monitoring device, and infusion pump—is completely integrated. The hospital staff can follow a simple protocol to run the diagnostic procedure through the devices.

Hospitals and clinics are now realizing the tremendous advantage in buying biomedical equipment that has intelligence on-board to network and collaborate with other devices in a fairly standard way.

Intelligent Medical Devices as Controllers?

But where can medical devices go next? What are some of the possibilities?

The next step for these devices would be to extend the capability slightly, so that these devices can operate as the supervisory controller for a small network of devices. These “supervisory control”-capable devices can be used to perform continuous monitoring of patient status and automatically make small adjustments to patient care, relieving highly skilled technicians or nurses of these tasks.

To do this, medical device designers and manufacturers must determine how their device can assume that controller role, have the intelligence to do the requisite analysis, and integrate with the other necessary devices involved in patient care. The use of these types of intelligent devices in surgery and post-op recovery care to monitor vitals would reduce the mundane work of surgical nurses and the cost of care.

For example, one of the common jobs of intensive care unit (ICU) nurses is to bring patients out of general anesthesia in a way that reduces the patient’s recovery time. ICU nurses must continuously monitor blood gas and other patient vitals, make periodic calculations based on a patient’s profile to know what to infuse into the patient, and then initiate the infusion process. This time-consuming process is performed by a limited pool of highly skilled nurses.

Medical device designers might consider how they could enable a blood gas monitoring device to communicate with an infusion pump and other patient monitoring equipment, perform analysis, and then, based on a validated patient protocol, issue the controls to the infusion pump. Certainly, government regulation and approval would have to be considered in the planned development of these types of “controller” devices. But it’s possible that we will see these self-operating devices in the near future.

IFUs: Another Area for Innovation

Another area that could benefit from hospitals’ push for on-board intelligence in medical devices is the area of Instructions for Use (IFUs), which typically come in paper booklets that accompany a device. The FDA recently approved electronic IFUs.

This allows technicians or physicians who want to know how to use or implant a device to go to a Web site to download IFUs instead of having a paper copy. With electronic IFUs, updates are immediate and more accurate. They also make it easier for nurses to include IFUs in an electronic patient record, instead of having a physical copy of the instructions in a separate, hard copy file for patients.

However, the reality is that few physicians or technicians read the IFUs, whether they are paper or electronic versions. Most of the time, they learn to use the devices through in-service training sessions from medical device sales representatives.

The opportunity for medical device designers is to devise a way to deliver both electronic IFUs and in-service training via the device itself, leveraging the existing on-board intelligence. For example, it would be great if technicians could access the IFUs electronically for a device and then have the option of learning how to apply the device as well via an online, click-through, interactive tutorial.

For devices that are more sophisticated or outfitted with on-board intelligence, it should be possible for medical device manufacturers to leverage the intelligence and deliver the IFU and in-service training directly.

This could help address the concern around electronic IFUs in Europe, for example, that medical device manufacturers are responsible for pushing or delivering the IFU with the device, instead of having physicians download it directly from a Web site.

Investing in Intelligent Medical Devices

As more intelligence is being introduced on devices, medical device manufacturers and designers should be thinking about how to leverage that intelligence to add even more value to hospitals or clinics. The ability of medical devices to support asset management, location tracking, and networking with other devices is now critical.

Although this intelligence might require upfront investment, the devices that don’t have these capabilities in the future will actually cost hospitals more in the long-term. Therefore, hospitals are now making this a priority on their “purchasing checklist.”

There's also a real market opportunity for medical device manufacturers to sell medical equipment with accompanying supervisory control systems that could provide tremendous value to hospitals in the future. This would be a major advancement for medical device manufacturers in servicing hospitals by helping them manage costs and better utilize their key resources to operate more efficiently. These market needs and medical device growth opportunities are well worth exploring.

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